

IMPROVE Station Protocol

Reporting Office: Seney National Wildlife Refuge

Targeted Species: None-Abiotic (Air Quality)

JUSTIFICATION AND OBJECTIVES

The USFWS has legal responsibility for the protection, preservation, and enhancement of “trust” resources. Trust resources include Service lands and associated biota. Many of the Service’s trust resources are currently or have the potential to be impacted by air pollutants. The Air Quality Branch, Division of Refuges and Wildlife is responsible for coordinating the management of air resources in all areas administered by the Service. Of particular importance is the management of air quality in Mandatory Class I wilderness areas as designated in the Clean Air Act (CCA) (USFWS 1982).

The *Clean Air Act Amendments* of 1977 provides guidance for protecting air quality. Of particular importance to the Service is the Prevention of Significant Deterioration (PSD) program outlined in sections 160 – 169. Among the purposes of the PSD program are (USFWS 1982):

“to preserve, protect, and enhance the air quality in national parks, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value.”

“to assure that any decision to permit increased air pollution in any area to which this section applies is made only after careful evaluation of all the consequences of such a decision and after adequate procedural opportunities for informed public participation in the decision making process.”

In 1985, the IMPROVE (Interagency Monitoring of Protected Visual Environments) visibility monitoring program was initiated. IMPROVE is a cooperative program of the National Park Service, U.S. Forest Service, Bureau of Land Management, USFWS, Environmental Protection Agency and state and tribal organizations. IMPROVE was established to aid the creation of Federal and State implementation plans for the protection of visibility in Class I areas as stipulated in the 1977 amendments to the Clean Air Act (Crocker Nuclear Laboratory).

On July 1, 1999, a Final Rule (Vol. 64, No. 126) of the Environmental Protection Agency (EPA) was published and implemented concerning Regional Haze Regulations, 40 CFR Part 51. The final rule formed Regional Planning Organizations (RPO) to oversee implementation of these regulations. The final rule established a schedule setting forth deadlines by which the States

must submit their first regional haze State Implementation Plans (SIP) and subsequent revisions to the first SIP. The rule also included a requirement for each state to develop a monitoring strategy. States are also required to make data from these monitoring sites available to the EPA and other agencies. (64 FR 35743) (EPA).

The 1999 Final Rule (64 FR 35715) (EPA) defined regional haze as a visibility impairment that is produced by a multitude of sources and activities which emit fine particles and their precursors and which are located across a broad geographic area. The fine particulate matter (e.g., sulfates, nitrates, organic carbon, elemental carbon and soil dust) that impairs visibility by scattering and absorbing light can cause serious health effects and mortality in humans and contribute to environmental effects such as acid deposition and eutrophication.

In the 1999 Final Rule (64 FR 35714) (USFWS) under regional haze regulations it noted, "Section 169A of the Clean Air Act sets forth a national goal for visibility which is the "prevention of any future, and the remedying of any existing impairment of visibility in Class I areas which impairment results from manmade air pollution". Seney National Wildlife Refuge is one of two Class I areas in the Midwest RPO with Isle Royale National Park being the other.

The 1992 USFWS "Draft Air Quality Monitoring Strategy" included the following:

"The goal of the Service's air quality management strategy is to ensure that air quality and related data are collected and analyzed in a manner that which provide Air Quality Branch, regional and refuge personnel with the information necessary to effectively protect Class I wilderness and meet legal requirements."

"These plans will include the acquisition of data that will support the Prevention of Significant Deteriorations (PSD) permit review process and that can be used to determine trends in ecosystem components as related to air pollution impacts."

At Seney NWR the first step in this process was a Property Access Agreement between the Michigan Department of Environmental Quality (DEQ) and Seney NWR dated October 1998 for the installation of air monitoring equipment. "Federal Law requires the State of Michigan to create and maintain a network to provide air quality monitoring" (Michigan Department of Environmental Quality 1998). The refuge area set aside for the placement of equipment consists of less than one acre just past and to the west of Quarters #1 and surrounded by F Pool.

Air pollution monitoring began in December 1999 when an IMPROVE station was established. The purposes of the monitoring were to (Michigan Department of Environmental Quality 2002):

- establish current visibility and aerosol conditions in mandatory Class I areas;
- identify chemical species and emission sources responsible for existing man-made visibility impairment;
- document long-term trends for assessing progress toward the national visibility goal; and
- provide regional haze monitoring representing all visibility-protected federal Class I areas.

DATA COLLECTION PROCEDURES

The IMPROVE station is located in a small shed. Inside the shed there are 5 air sampling stations with 4 discreet filters per station. Each filter's specifications are determined by sampling requirements. Sampling is scheduled by processor over a 3 week cycle. During the cycle, filters are replaced and/or rotated weekly. Data is taken manually at the beginning and end of each weekly filter exchanges. At the end of the 3rd week, the cycle begins again. The filters that have been exposed to sampling along with the data sheets are returned to a lab, UC Davis, for analysis. The primary items analyzed are:

- Gravimetric mass, optical absorption, hydrogen, sodium, manganese, iron, lead, nitrates, chloride, sulfate, nitrites and carbon.

The NADP (National Atmospheric Deposition Program) was originally established on November 28, 2000 (NTN – National Trends Network) and expanded in November 11, 2003 (MDN – Mercury Deposition Network). The network is composed of three separate platforms. The NTN platform is composed of a precipitation chemistry collector. This system has a protected collection bucket that opens when rain and/or snow is sensed and closes when moisture is not present. The bucket is removed weekly using the proper sampling collection methods and maintenance required. The sample is examined for contaminants and weighed to determine rainfall for the week. This rainfall data is compared to the site's electronic rain gage for accuracy. Data is entered into the weekly data sheet. The sample is poured into a sterile bottle and returned with data sheet weekly to the lab, Frontier Global Sciences, for analysis. The lab measures for the following:

- Free acidity, conductance, calcium, magnesium, sodium, potassium, sulfate, nitrate, chloride and ammonium. The lab also measures for orthophosphate, but only for quality assurance as an indicator of sample contamination.

The second platform hosts a rain gauge. This device collects continuously with no protective covers. It counts the number of times the MDN and NTN indicate a lid opening. Its temperature compensates for accurate water volume. Ambient temperature and a host of other points are collected. Weekly precipitation is compared to the NTN and MDN data. The data from the rain gauge is downloaded via computer by wireless connections.

- The third platform, MDN, also hosts a precipitation collector.

The MDN is the only network providing a long-term record of total mercury (Hg) concentration and deposition in precipitation in the United States and Canada. This system has a temperature controlled enclosure to prevent freezing of the collected rainwater samples. If rain or snow is sensed a protective cover is driven open exposing the rainwater collection bottle. When rain or snow is no longer sensed the protective cover returns to the closed position to protect the sample bottle. The collection bottle is provided with a preservative to prevent contamination. The sample is collected weekly and all glassware in contact with rainwater is replaced with sterile equipment for the following week's sample. Proper sampling collection methods and maintenance are required. The sample is examined and appropriate data is entered. The sample and data forms are returned weekly to the lab, Frontier Global Sciences, for analysis. The sample is analyzed for all forms of mercury.

- The Michigan DEQ is responsible for the final measuring device at the site. The DEQ has a trailer. Inside the trailer is the equipment that collects and stores data on TOEM (fine particles) and ozone.

TEOM continuously samples 24 hours per day. It measures the volume of particles <250 microns. Ozone is sampled from April through September and measures concentrations in parts per billion. The data are continuously recorded to a computer in the trailer. **Staff associated with Seney do not collect any samples related to these systems.** Every other week, staff verify the accuracy of the instruments and do any preventive maintenance on any of the instruments inside the trailer or the flow element and temperature meter both located on the roof of the trailer and connected to TEOM data collection. **In addition, on the top of the trailer are instruments continuously collecting wind speed and direction, ambient temperature, relative humidity, barometric pressure and solar radiation.** This information is automatically archived to the computer in the trailer. The State can remotely access any of the data being collected at the trailer. The State sends the collected data to a Federal database.

- A fourth tool used to monitor air quality is located separately from the “IMPROVE” site. A “hazecam” is located in the top of the fire tower next to the office, approximately 1/4 mile from the “IMPROVE” site.

A visibility camera or hazecam was established in Seney in 2001 as part of a regional camera network in the Upper Midwest. The purpose of the camera network is to provide the public and others with information about visibility (Michigan Department of Environmental Quality 2002). The hazecam is located at the top of the fire tower next to the Refuge office.

DATA ANALYSIS, REPORTING AND STORAGE

Data from the IMPROVE station can be accessed at the IMPROVE website, http://vista.cira.colostate.edu/improve/publications/SOPs/Email_Registry/logon.asp.

Data from both the NTN and MDN are sent to the NADP program office and are made available to anyone on the NADP web site, <http://nadp.isws.illinois.edu>.

Data from the State of Michigan can be accessed through the Michigan Department of Environmental Quality.

Images from the camera can be found at the website, www.mwhazecam.net.

MANAGEMENT ACTION THRESHOLDS

Memorandum of Agreements concerning ambient air monitoring at Seney NWR were signed in 2001, 2004 and 2006 between the Lake Michigan Air Directors Consortium acting on behalf of the Midwest Regional Planning Organization, the Michigan DEQ and the USFWS through Seney NWR.

The purpose of the air monitoring program at Seney NWR is as a member of the continental network of sites monitoring air/precipitation chemistry and pollutants for monitoring of geographical and temporal long-term trends at both a continental and local scale. Also to provide data to decision makers when entities are requesting a permit through the States for new or expanded air emission source permits where the emissions could fall over or impact the Seney Class I airshed which would trigger a PSD review. This last occurred with a permit request in 2009

LITERATURE USED

- Crocker Nuclear laboratory. Undated. IMPROVE Standard Operating Procedure, SOP 201 Version 3 (SPO 201-3) Sampler Maintenance by Site Operators. Unpublished report. University of California, Davis, California. 40pp.
- Environmental Protection Agency. 1999. Regional Haze Regulations; Final Rule. Federal Register 64:35714-43.
- Michigan Department of Environmental Quality Air Quality Division. 1998. Property Access Agreement. 2pp.
- Michigan Department of Environmental Quality. 2002. Memorandum of Agreement between the Lake Michigan Air Directors Consortium, United States Fish and Wildlife Service and the Michigan Department of Environmental Quality. 7pp.
- USFWS. 1992. Draft Air Quality Monitoring Strategy. Washington, D.C. 22pp.

EFFORT AND COSTS

Seney NWR is responsible for payment of utilities at the site (including the hazecam), site access (e.g., snow removal, site maintenance e.g. mowing), and providing or facilitating personnel to collect the data and monitor the equipment. The office of Air Quality in Denver normally provides around \$3,500 each year to help offset these costs. The State of Michigan also provides funding to help pay for monitors. The data have/are to be collected once a week, standardly on Tuesdays, 52 weeks out of the year. Currently two intermittent staff members are collecting the weekly data.

NADP has a three day training course that is offered in Champaign, Illinois on how to operate a NTN site. The training primarily focuses on NTN operations, but depending on interest may also cover MDN operations to some extent. Of the two people currently operating the site, one attended the formal training and the other individual has not.